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1/77

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Newport  
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1. Your reference RCA/41591

2. Patent application number  
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110 MAR 2000

0005878.4

3. Full name, address and postcode of the or of each applicant (underline all surnames)

BRITISH BROADCASTING CORPORATION  
Broadcasting House  
LONDON  
W1A 1AA

3495500

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of incorporation

United Kingdom

4. Title of the invention

METHOD AND APPARATUS FOR BROADCAST SIGNAL RECORDING

5. Full name, address and postcode in the United Kingdom to which all correspondence relating to this form and translation should be sent

Reddie & Grose  
16 Theobalds Road  
LONDON  
WC1X 8PL

Patents ADP number (if you know it)

91001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application  
(If you know it)

Date of filing  
(day/month/year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
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8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

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Description	13
Claim(s)	7
Abstract	1
Drawing(s)	4 + 4



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Request for preliminary examination and search (Patents Form 9/77) 1

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11.

I/We request the grant of a patent on the basis of this application.

Signature

Date

*Roddie + Crose*

10 March 2000

12. Name and daytime telephone number of person to contact in the United Kingdom

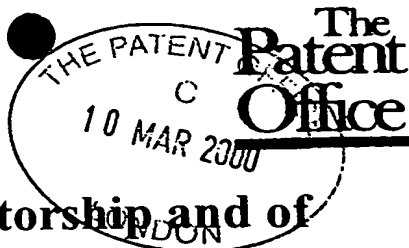
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0171-242 0901

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The Patent Office

Cardiff Road  
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1. Your reference RCA/41591 0005878.4

2. Patent application number (if you know it) 110 MAR 2000

3. Full name of the or of each applicant BRITISH BROADCASTING CORPORATION

4. Title of the invention METHOD AND APPARATUS FOR BROADCAST SIGNAL RECORDING

5. State how the applicant(s) derived the right from the inventor(s) to be granted a patent By virtue of the inventor's employment by British Broadcasting Corporation

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Date

*Richard C Abnett*

10 March 2000

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White City  
201 Wood Lane  
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## METHOD AND APPARATUS FOR BROADCAST SIGNAL RECORDING

### Background of the Invention

5 This invention relates to programmable recorders and methods of programming recorders for broadcast television or sound broadcasts.

10 Video recorders for recording broadcast television signals are well known in which, to record a desired television programme, the video user has to enter programme information into the video recorder, either through a video handset, through buttons on the video recorder casing, or through a television function menu. The programme information might be start and finish time, the date and channel, or, alternatively, it might be a  
15 programming code such as Programme Delivery Control (PDC) or Videoplus (RTM) which automatically provides the video recorder with the information it needs to record at the proper time. The present arrangement works satisfactorily so long as the video user has the opportunity to review television schedules for possible programmes of interest,  
20 and has access to the video recorder to enter the programme information. However, if the video user is not present to enter programme information, it is not possible to record a program. Considering that the aim of a video recorder is to facilitate recording of programmes that are  
25 broadcast at times inconvenient for a user, this is clearly a drawback.

Known video recorders, therefore, disadvantage a user by requiring them to ensure that well in advance of  
30 programme transmission they are present to enter programme information and set the video to record.

It is also known for digital broadcast television signals to include individual addresses for receiving television decoders in order to control the conditional-  
35 access permission of the viewers such as with a subscription television service.

### Summary of the Invention

The invention in its various aspects is defined in the independent claims below to which reference should now be made. Advantageous features of the invention are set forth in the appendant claims.

A preferred embodiment of the invention is described in more detail below with reference to the drawings. In this system video programming signals are generated by a digital television broadcasting service in response to recording information entered by a viewer at a website of the broadcaster. The information includes start and finish time, date and channel information, or may be Programme Delivery Control codes. The information also includes address information for the viewer's recorder. The information is multiplexed with the composite broadcast signal such that video programming signals are broadcast to the viewer's video recorder. The signals are received by a digital decoder which checks for a unique video identifier address that matches the viewer's video recorder. If a matching address is found the digital decoder transfers the off-air video programming instructions into the memory of the video recorder, thus effecting video recorder programming.

### Brief Description of the Drawings

The present invention will now be described in more detail by way of example with reference to the drawings, in which:

Figure 1 is a schematic diagram illustrating the preferred system by which a user can remotely program their video recorder through a television broadcaster's computer network;



**Figure 2** is a schematic diagram illustrating in more detail the broadcaster's transmitter end of the system of Figure 1;

**Figure 3** is a schematic diagram illustrating in more detail the user's receiver end of the system in Figure 1; and

**Figure 4** is a flow chart illustrating video programming signal generation and transmission according to the preferred system.

#### 10       **Detailed Description of the Preferred Embodiments**

The preferred system, illustrated by Figure 1, enables a viewer to effect programming of a video recorder that is remote from their present location.

At the broadcaster's transmitting station 10 a conventional broadcast signal is generated such as by a camera or other signal source 12 and encoded in conventional fashion. The encoding equipment is not shown in Figure 1. The encoded transmission signal is then applied to a transmitter 14 illustrated by a radio tower in Figure 1. The transmitting station also includes a control computer system 20 which provides control data on a line 22 to a combiner or multiplexer 26 which receives the encoded broadcast signal from the signal source 12 before application to the transmitter 14.

25       A viewer can access the broadcaster's control computer system 20. As shown this is achieved by the viewer using a personal computer 30, which is at a remote location, to contact the computer system 20. The contact may be by a direct dial-up link or via the internet, this connection being indicated diagrammatically in Figure 1 by  
30       a line 32.

A receiving station 40, which may be located at a viewer's home or at another location where a viewer might wish to stay, such as a hotel room, may include a receiving aerial 42, a digital television decoder 44  
5 connected to the aerial 42, a home video recorder 46 connected to the output of the decoder 44, and a conventional receiver 47 connected to the output of the video recorder 46.

The transmitting station 10 is shown in more detail  
10 in Figure 2. Here the relevant components of the control computer system 20 and the manner in which they are controlled by the viewer are illustrated. The home user at a personal computer 30 can connect through the internet 32 with the broadcaster's Website 60. The Website 60  
15 hosted on a computer is supplied with schedule information by an appropriate source 62 of this information. The information received from the viewer at the computer 30 via the Internet and the Website is passed to a database 64 and to an encoder 66, which also receives information  
20 from the database 64, as described below. The encoded information from the encoder is then placed in a queue 68 which is controlled by a queue control module 70 to apply queued items from the queue 68 to the multiplexer 26 at appropriate times. The queued and encoded items are then  
25 transmitted as part of the normal broadcast digital television signal by transmitter 14.

A receiving station is shown in more detail in Figure 3. The broadcast signal is received at the aerial 42 and applied to the digital TV decoder 44, commonly known as a  
30 "set-top box". The decoded video and audio signals are then applied to a recorder over line 48. In Figure 1 this was shown as a videotape recorder 46, whereas in Figure 3

it is assumed that the recorder 80 is based around a hard disc 82. The recorder 80 or at least the disc 82 may be accommodated within the television receiver 47 itself, or they may be in a separate unit attached to the receiver, for example using the receiver's SCART socket or other connector.

In addition the decoder 44 has a second, data output 50 for user data. A circuit 84 is connected to this output and monitors addresses associated with each item of information transmitted in a predetermined location on the broadcast signal as defined below. Each receiving station has a unique user address, and circuit 84 monitors the transmitted addresses. When it finds a message intended for its own address, it passes this message to a memory circuit 86 which stores it. The message contains information identifying a programme to be recorded. The circuit 84 could alternatively be housed in the decoder 44 rather than the recorder 80.

Associated with the hard disc 82 is a memory checking circuit 88. This periodically checks the memory 86 to determine whether any action is required at that time to cause the hard disc to start or to stop recording the incoming signal. To this end the memory checking circuit 88 is connected to an internal clock 90 at the receiver station. If programme delivery control (PDC) codes are being transmitted instead of times, then the memory checking circuit is connected to a PDC code decoder which is connected to receive data from the decoder 44.

The operation of the preferred embodiment illustrated will now be described.

In operation, a viewer who is not present at the receiving station 40 to program the desired video recorder

in person, may contact the website 60 associated with the  
broadcaster's computer system 20, using the computer  
terminal 30. The website 60 displays scheduling  
information for the broadcasting network and presents over  
5 the Internet 32 an interface on the computer 30 for a user  
to enter programme details for recording. The  
broadcaster's computer system 20 encodes the video  
programming request received from a user in this way in a  
digital format as control data which is to be applied over  
10 line 22 to the multiplexer 26. The control data is then  
combined with the digital television signal 24 from the  
source in the multiplexer 26 and is transmitted to the  
viewer's home from the transmitter 14.

At the receiving station 40 user's the videoplayer 46  
15 receives the video programming message transmitted by the  
broadcaster, and downloads the programme information into  
its stored programme memory. In this way, the preferred  
system allows a user to remotely issue commands to their  
video recorder to record programmes of interest.

20 The data that a user needs to provide to the  
broadcaster's computer system through the Internet to  
effect recording consists of a video recorder identifying  
address, as well as the recording details themselves, such  
as the date, the start time and either the duration or the  
25 finish time of the broadcast, the television channel, and  
whether Long Play or Short Play is desired.

Alternatively, instead of sending the start time and  
duration/finish time, the recording details can be entered  
as a single programme identifier code, as with the current  
30 Programme Delivery Control (PDC) system.

The broadcaster's computer system 20 is preferably  
configured to allow the user to enter general programme

preferences for automatic recording of programmes according to type or content. If for example, the user indicates that they are interested in recording musicals or sporting events, they enter this information at the website 60 and the computer system logs it in the user database 64. Whenever the broadcaster's program schedule changes, the computer system 20 scans through the new schedule 62 and the user database 64 for programmes that match the logged preferences. If there are any television programmes that match, then the computer system can automatically issue 'record' commands to the video recorders of all users who expressed a desire to record programmes of that type. In this way, users who do not have access to the current scheduling information and therefore do not know what programs are due to be shown or at what times, can, by entering preferred programme types, ensure that their video recorder records programmes of interest in their absence.

Alternatively, a second tier of addresses can be used to command home recorders to record programmes that the broadcaster recommends. For example, one of the second tier addresses may be for all users interested in sport. The broadcaster then uses this command to inform the home recorder that a sports programme is to be transmitted. In another possible arrangement, the generic code is itself transmitted to the home receiving station. At the receiving station a determination is made as to programme content for each incoming programme. This could be done with additional codes transmitted as part of the television signal, or with the existing programme type codes transmitted on radio signals for example.

The mode of operation of the preferred system according to the present invention will now be described in more detail with especial reference to the flow chart of Figure 4.

5       A viewer logs on to the internet, at a computer terminal 30 and accesses the website 60 provided by the broadcaster. The website 60 displays schedule information and such interfaces as are necessary to allow a viewer to select programmes they wish to record. Entering  
10       information of programmes of interest, can be achieved by highlighting a program on the displayed schedule using cursor keys or the mouse pointer, by typing the programme details in at the cursor of one or more text entry windows, or by selecting 'radio' buttons to indicate more  
15       general preferences. It will be understood that there is a wide range of GUIs (Graphical User Interfaces) that the broadcaster could provide for the entering of programme details. The entering is shown at step 100 in Figure 4.

      Once the viewer has confirmed that the programme  
20       details they have entered are correct, the broadcaster's computer system 20 processes the information. A determination is then made, step 102, as to whether the user data is a specific or a general video programming request. If the user information relates to one or more  
25       specific record events, Y at step 102, then it is passed to the encoder 66 where it is encoded, step 104, as a video programming signal in a format suitable for transmission, and is then passed to the queue 68, step  
30       106. Video programming signals are read from the queue sequentially, and passed to the multiplexer 26. They may be repeated, as described below. The multiplexer combines the queued user information encoded as a video programming

signal with the television broadcast data from the source 12, step 108, and broadcasts it to all receivers of the television signal, step 110.

5 If however the user information does not specify a particular programme but specifies instead general programme preferences, N at step 102, then this information is stored or logged in the database 64 of user preference information, step 112. Each time a new television programme schedule 62 is posted to the website 10 60 of the broadcaster's computer network 20, the computer network compares the schedule with the preferences that have been specified by the user and stored in the database, step 114. For each match between a viewer preference and a television programme, Y at step 114, the 15 computer system receives programme details from the schedule 62, step 116, and passes programme and user details to the encoder 66 to generate a specific video programming signal for transmission to the viewer's video recorder.

20 The preferred system is a digital television network, which reserves part of the MPEG transport stream used to transmit digital television broadcast signals for the transmission of digital user data. The type of data that is encoded into the video programming part of the 25 transport stream according to the preferred system is shown in the following Table.

TABLE

Purpose of field in message	Number of bytes required
Address of home recording device	16
5 Days ahead from time of message	1
Time	2
Duration: minutes divided by 4	1
10 Channel Number	2
Total	22

A total of 22 bytes are thus required with this example. If the IPv6 Internet address standard is used as the addressing protocol, and 100 kb/s of the multiplex are  
15 set aside, this allows two million messages to be sent every hour. In practice a message is sent several times to ensure proper reception, and this typically reduces the channel capacity by a factor of, say, three.

To ensure that the video recorder to which a record  
20 signal is directed has received the signal, the preferred system repeats transmission of the record signal a number of times. This is illustrated at step 120 in Figure 4. Clearly the transport stream has a maximum capacity of video programming signals that it can transmit. If the  
25 transmission of video programming signals is to be repeated several times, it is possible that at certain times the number of video programming signals in the queue, including repeat signal transmissions, is so great that the transport stream approaches capacity. In such a  
30 situation there is the danger that certain video



programming signals would not be transmitted in time to inform the video recorder of a programme's details. To address this problem, the queue is therefore managed by a queue control module 70 which monitors the length of the queue and how many times a video programming signal has been transmitted. The queue control module 70 adjusts the number of repeat transmissions in accordance with the load on the system, that is the length of the queue, so that it is less when the system is busy.

Each video recorder has a unique identifying address, so that a single recorder can be individually referenced and have an individual video programming signal forwarded to it. Digital television companies are already able to individually address each digital TV decoder in order to control the conditional channel access permission of the viewer, e.g. for subscription television services. Thus, known digital TV decoders constantly monitor the incoming signal for addressing information. The circuitry required for this is therefore not described in detail.

Figure 3 illustrates the reception of an incoming video programming system according to the preferred system using a hard disc 82. The digital decoder 44 employed in this system intercepts the incoming combined digital television/video programming signal, and constantly monitors and processes the user data part, checking for an address that corresponds to an associated video recorder. If a matching address is found for the video recorder, then the processed data from the video programming signal is passed to the memory 86 of the video recorder, which can then record the program on the hard disc 82 in the usual way.

Although the preferred system uses the separate digital decoder 44 to intercept and decode the video programming signal for the video recorder, it is appreciated that the decoding circuitry for video record  
5 transmission might alternatively be housed in the video recorder itself.

Hard disc video recorders are now becoming available and are anticipated to have recording times of tens of hours. This figure will doubtless increase as advances  
10 in computer technology allow hard discs with larger and larger capacity to be built. The advantages of the preferred system are particularly apparent when used in conjunction with a hard disc video recorder since a viewer can then set up their video to record programmes of  
15 interest while they are away for an extended period. This would not really have been possible in practice with the standard three hour cassette tapes used in conventional video recorders because the tape would be soon used up and would need to be replaced. With a hard disc video  
20 recorder, a viewer is assured of much more space in which to record. Furthermore, not knowing the program schedule in advance is no longer a hindrance, since a viewer can program their video recorder while they are away from home. Even if a viewer has no access to the broadcaster's  
25 website while away, providing their programme preferences are entered into the website in advance, the broadcaster's computer network will program their video recorder to record programmes matching the profile.

In the system described, it has been assumed that the  
30 user will use a personal computer 30 at the remote location in order to instruct the broadcaster's computer system to transmit control signals to their video

recorder. Instead of a personal computer 30, other devices  
can be used such as, for example, wireless application  
protocol (WAP) telephones. In this way the user can  
programme their recorder when on the move or at any  
5 location where their telephone will operate.

In another modification, the broadcaster may have the  
option of transmitting a command that enables all  
recorders or a group of recorders to record at a given  
time or on receipt of the command.

10 It will be appreciated that many other modifications  
may be made to the system described. For example the  
system can be adapted for radio signals and audio  
recording.

CLAIMS

1. Apparatus for programming a broadcast signal recorder, comprising:

at a broadcaster location:

5 information receiving means for receiving information identifying a recorder at a recorder location and a programme or programme type to be recorded by the recorder;

generating means coupled to the information receiving means for generating an output signal containing information identifying the recorder and the programme or programme type to be recorded by the recorder;

10 multiplexing means coupled to the generating means for multiplexing the output signal with a broadcast signal; and

transmitting means coupled to the multiplexing means to transmit the multiplexed signal;

at a recorder location:

a broadcast signal recording device;

20 signal receiving means for receiving the transmitted multiplexed signal;

decoder means coupled to the signal receiving means for separating the transmitted multiplexed signal into a broadcast signal and a data signal containing information identifying a recorder and the programme or programme type to be recorded by the recorder;

25 address detector means coupled to the decoder means for detecting when the information identifying a recorder in the data signal identifies that particular recorder at the recorder location;

30 programme data store means coupled to the address detector means and operative when the address detector

means determines that the recorder identifying information in the data signal identifies that particular recorder at the recorder location to store the programme or programme type identifying information; and

5 means coupled to the programme data store means for determining whenever a programme or programme type identified by the stored information is being transmitted and in response thereto to activate the broadcast signal recording device; and

10 at a user location remote from the recorder location and the transmitter station:

user-operable means for transmitting to the broadcaster location information identifying a recorder at a recorder location and a programme or programme type to  
15 be recorded by the recorder.

2. Apparatus according to claim 1, in which the broadcast signal is a broadcast television signal.

3. Apparatus according to claim 1 or 2, in which the user-operable means at the user location comprises a  
20 personal computer.

4. Apparatus according to claim 1 or 2, in which the user-operable means at the user location comprises a mobile telephone.

5. Apparatus according to any of claims 1 to 4, in which  
25 the user-operable means transmits to the broadcaster location by means of a computer network, preferably the Internet.

6. Apparatus according to any of claims 1 to 5, in which the user-operable means transmits to the broadcaster location by means of telephone communication.

7. Apparatus according to any of claims 1 to 6, in which  
5 the broadcast signal is a digital signal and the transmitting means is constructed to transmit a digital signal.

8. Apparatus according to any of claims 1 to 7, in which the generating means is arranged to repeat the individual  
10 output signal.

9. Apparatus according to claim 8, in which the generating means is arranged to vary the number of repeats in dependence upon the number of items of information to be transmitted.

10. Apparatus according to any of claims 1 to 9, in which  
15 the broadcast signal recording device is a tape recorder.

11. Apparatus according to any of claims 1 to 9, in which the broadcast signal recording device is a hard disc recorder.

12. Apparatus according to any of claims 1 to 11, in  
20 which the means for determining whenever a programme or programme type identified by the stored information is being transmitted is arranged to compare timing information stored in the programme data store means with  
25 current time information.

13. Apparatus according to any of claims 1 to 11, in which the means for determining whenever a programme or programme type identified by the stored information is being transmitted is arranged to detect received programme delivery codes in the signal received at the receiver location and to compare the received codes with codes stored in the programme data store means.

14. A method of programming a broadcast signal recorder, comprising the steps of:

10           at a user location:

          transmitting, in response to user input, information identifying a recorder at a recorder location and a programme or programme type to be recorded by the recorder;

15           at a broadcaster location:

          receiving from the user location information identifying the recorder and a programme or programme type to be recorded by the recorder;

          generating from the received information an output signal containing information identifying the recorder and the programme or programme type to be recorded by the recorder;

20           multiplexing the output signal with a broadcast signal; and

25           transmitting the resultant multiplexed signal; and

          at a recorder location:

          receiving the transmitted multiplexed signal;

          separating the transmitted multiplexed signal into a broadcast signal and a data signal containing information identifying a recorder and the programme or programme type

30           to be recorded by the recorder;

detecting when the information identifying a recorder in the data signal identifies that particular recorder location;

5 storing, when the address detector means determines that the recorder identifying information in the data signal identifies that particular recorder at the recorder location, the programme or programme type identifying information; and

10 determining whenever a programme or programme type identified by the stored information is being transmitted and in response thereto activating the broadcast signal recording device.

15 15. Apparatus for use in the method of claim 14 for transmitting a multiplexed broadcast signal, the apparatus comprising:

information receiving means for receiving information identifying a recorder at a recorder location and a programme or programme type to be recorded by the recorder;

20 generating means coupled to the information receiving means for generating an output signal containing information identifying the recorder and the programme or programme type to be recorded by the recorder;

25 multiplexing means coupled to the generating means for multiplexing the output signal with a broadcast signal; and

transmitting means coupled to the multiplexing means to transmit the multiplexed signal.



16. Apparatus for use in the method of claim 14 for programming a broadcast signal recording device, the apparatus comprising:

a broadcast signal recording device;

5        signal receiving means for receiving a transmitted multiplexed signal;

decoder means coupled to the signal receiving means for separating the transmitted multiplexed signal into a broadcast signal and a data signal containing information  
10        identifying a recorder and the programme or programme type to be recorded by the recorder;

address detector means coupled to the decoder means for detecting when the information identifying a recorder in the data signal identifies that particular recorder at  
15        the recorder location; and

programme data store means coupled to the address detector means and operative when the address detector means determines that the recorder identifying information in the data signal identifies that particular recorder at  
20        the recorder location to store the programme or programme type identifying information; and

means coupled to the programme data store means for determining whenever a programme or programme type identified by the stored information is being transmitted  
25        and in response thereto activating the broadcast signal recording device.

17. A digital multiplexed broadcast signal comprising a digital broadcast signal, preferably a digital video signal, multiplexed with a data signal, the data signal  
30        containing addresses identifying individual signal recorders and containing information associated with the

addresses identifying programmes or programme types to be recorded by the recorders.

18. Apparatus for programming a broadcast signal recorder substantially as herein described with reference to Figure  
5 1 of the drawings.

19. Apparatus for programming a broadcast signal recorder substantially as herein described with reference to Figure 3 of the drawings.

ABSTRACT

(Figure 1)

**METHOD AND APPARATUS FOR BROADCAST SIGNAL RECORDING**

Video programming signals are generated by a digital television broadcasting service in response to recording information entered by a viewer at a website (60) of the broadcaster. The information includes start and finish time, date, and channel information, or may be Programme Delivery Control codes. The information also includes address information for the viewer's recorder. The information is multiplexed with the composite broadcast signal such that video programming signals are broadcast to the viewer's video recorder (46). The signals are received by a digital decoder (44) which checks for a unique video identifier address that matches the viewer's video recorder. If a matching address is found the digital decoder transfers the off-air video programming instructions into the memory of the video recorder, thus effecting video recorder programming.

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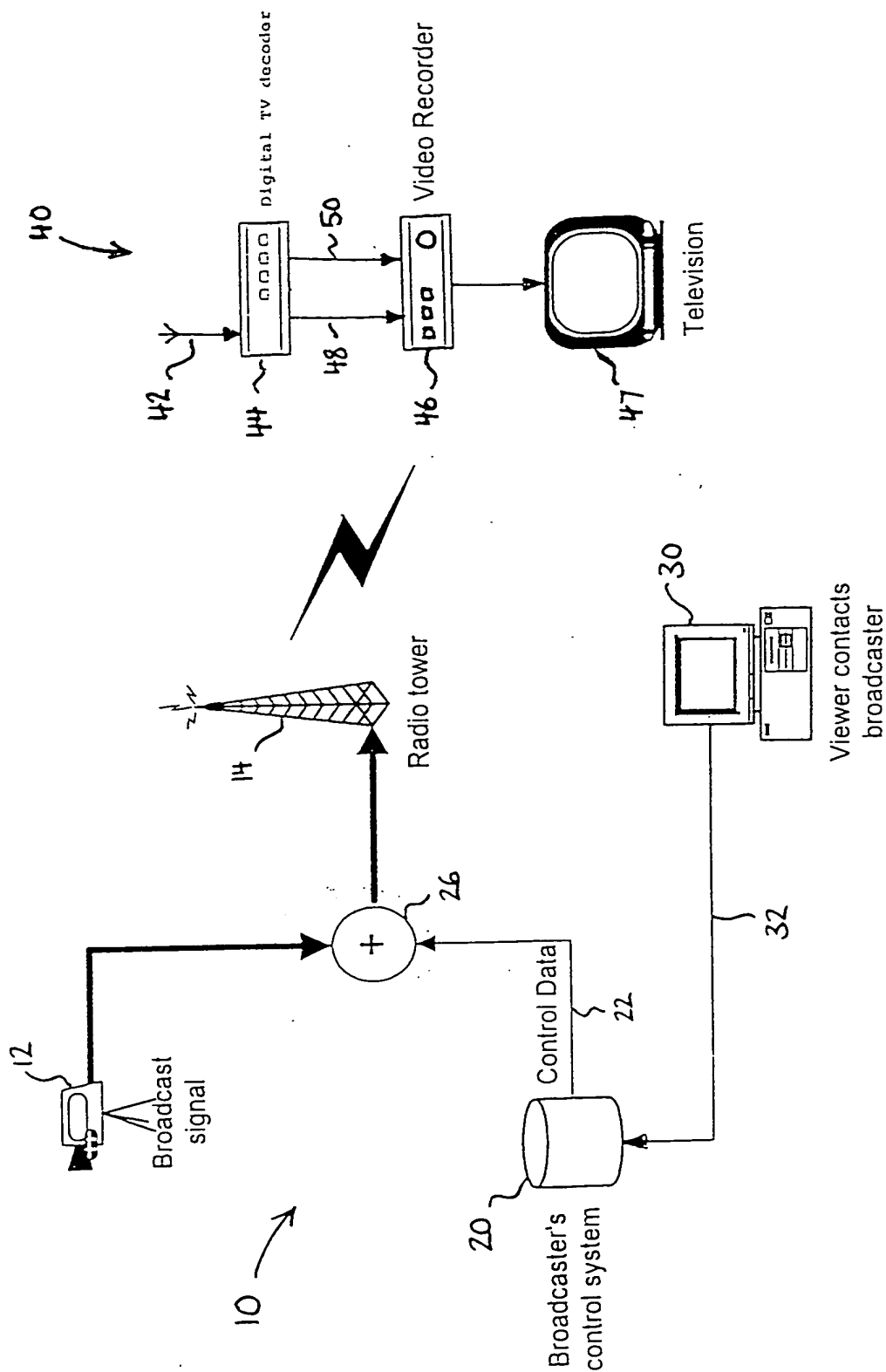


Fig. 1

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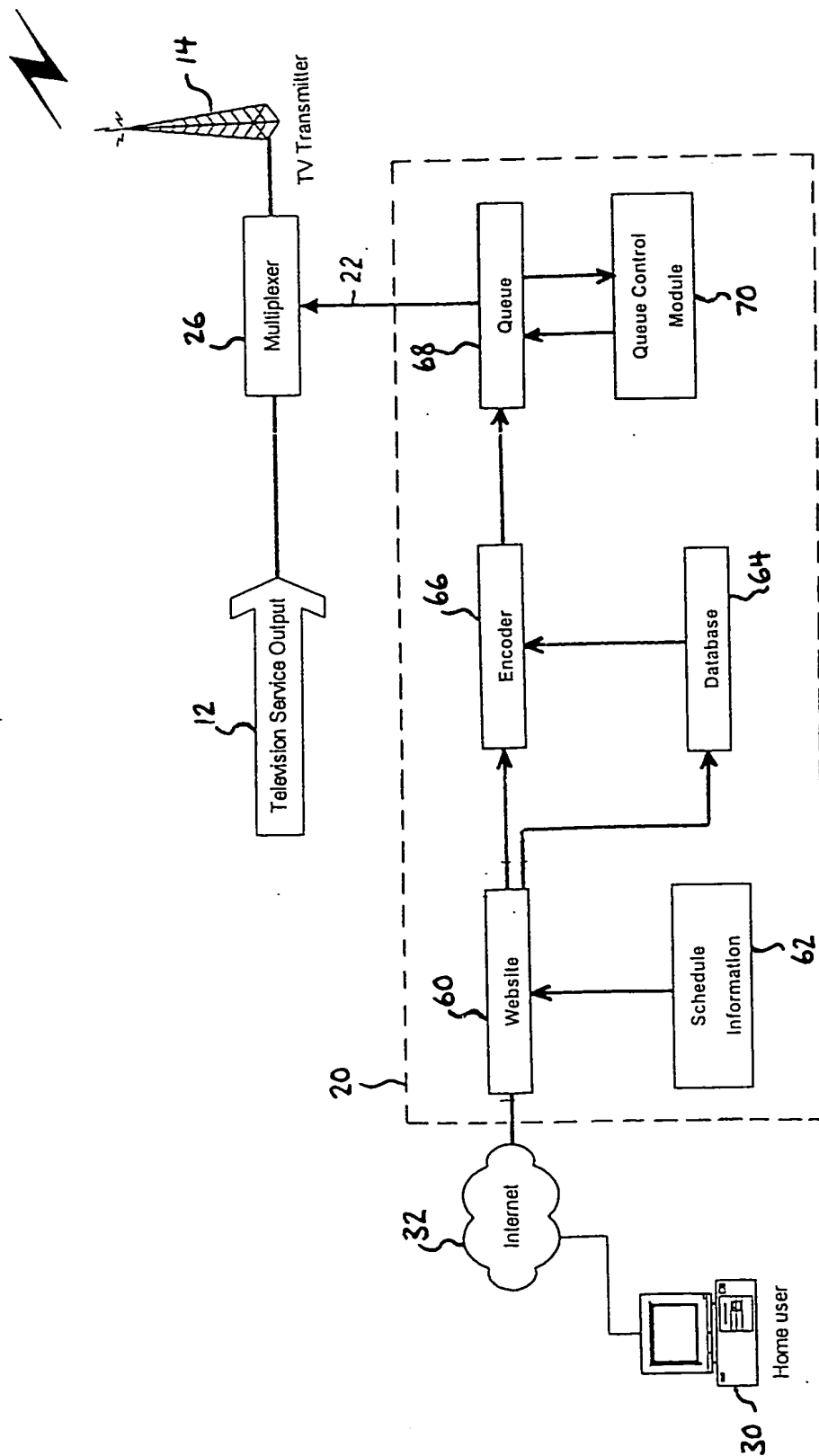


Fig. 2

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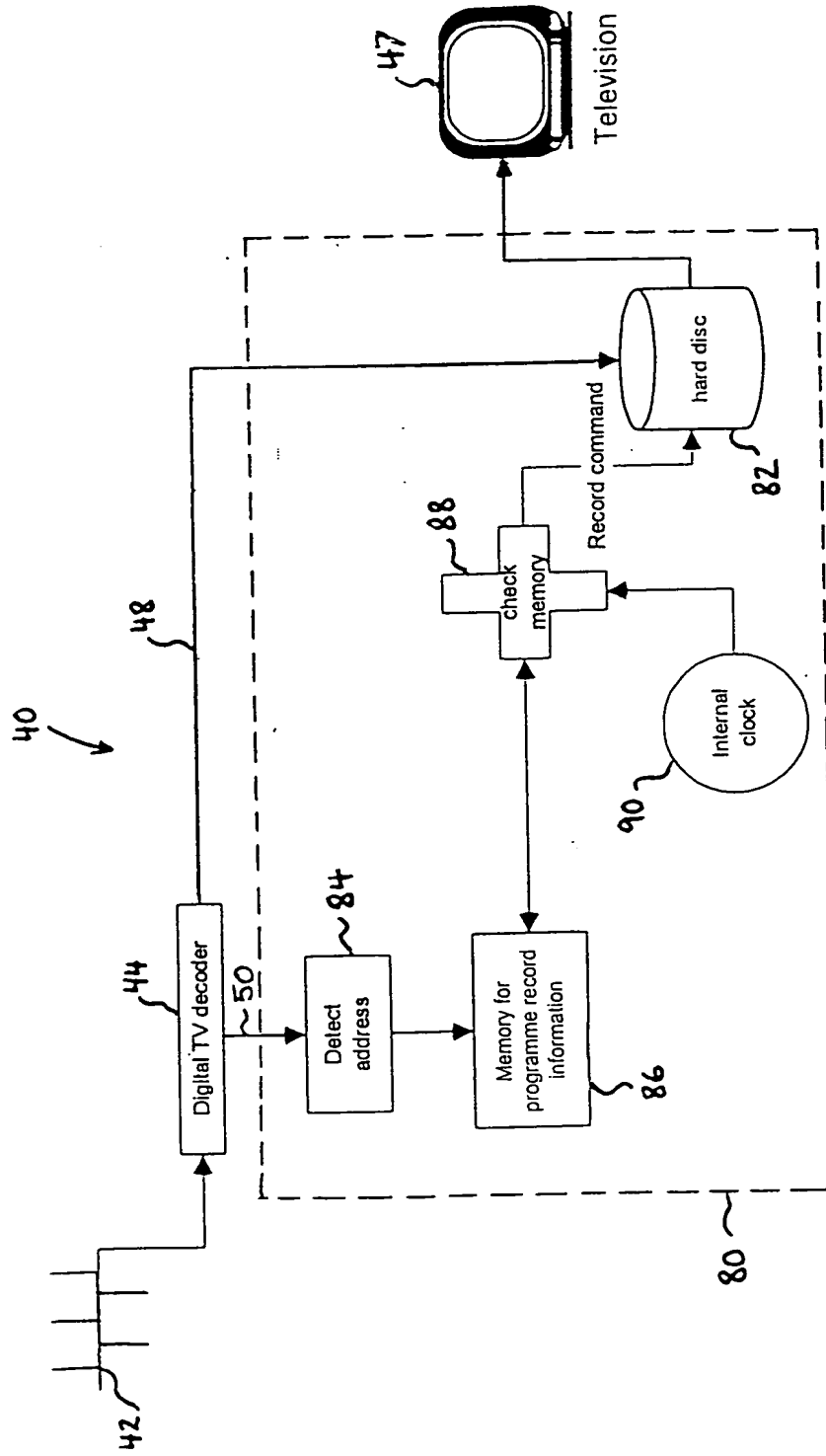


Fig. 3

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4/4

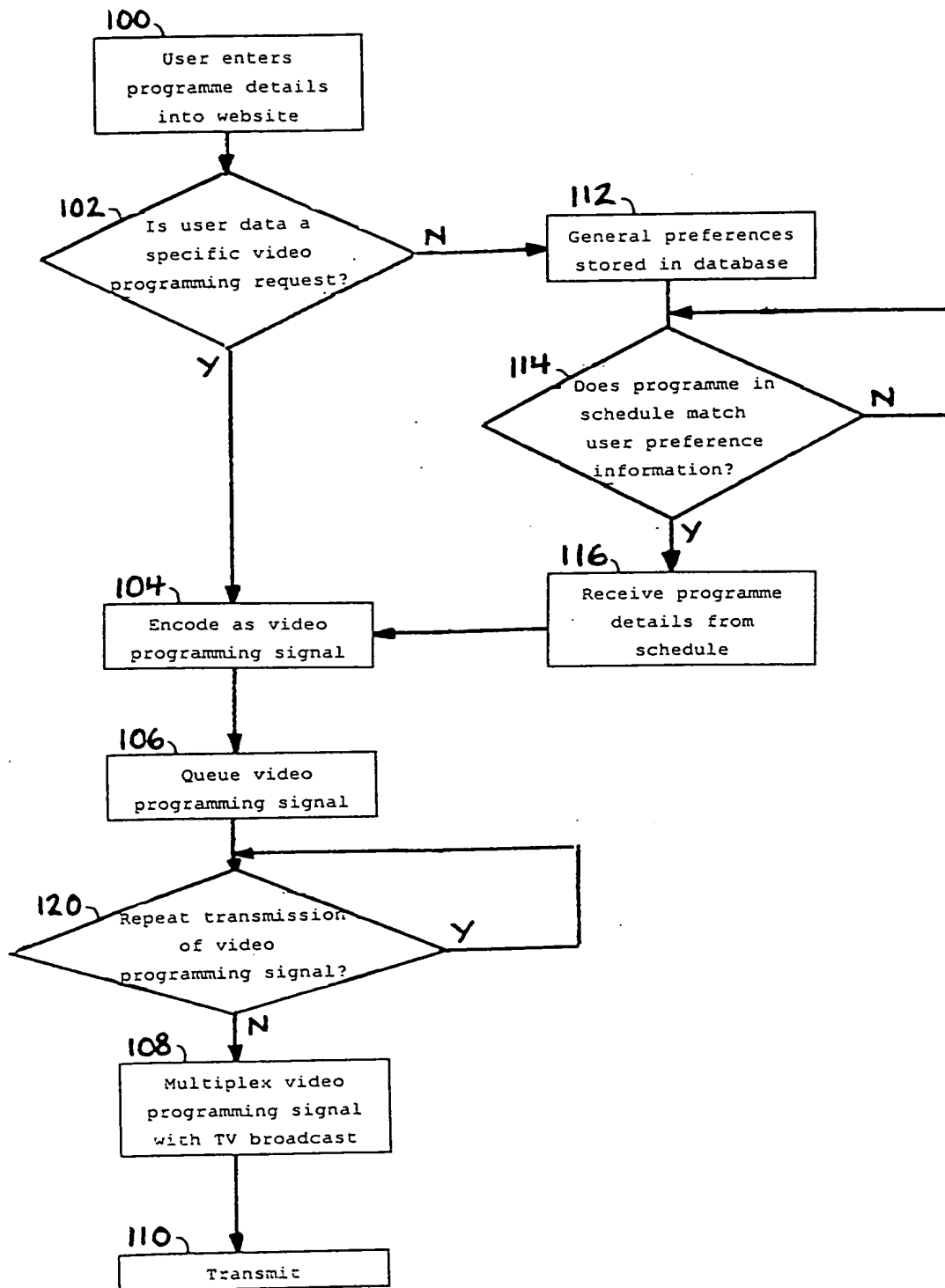


Fig. 4

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